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# AMSAT™ NEWSLETTER

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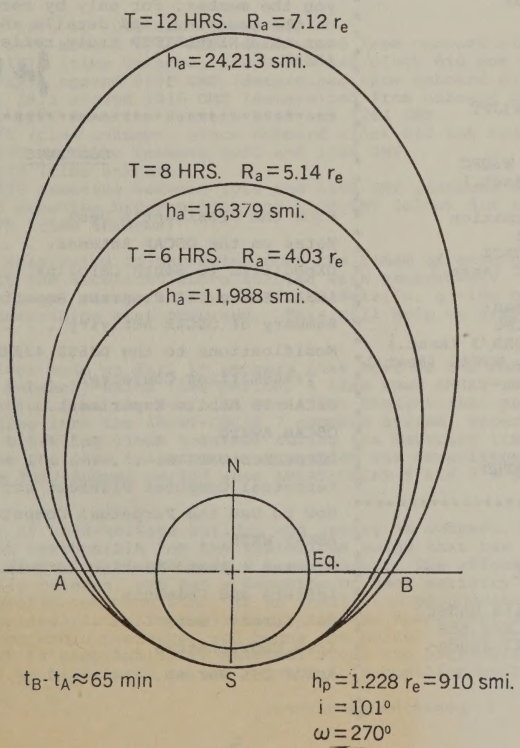
# RENEWAL ENVELOPE ENCLOSED

**ATTENTION** THIS IS YOUR NOTICE THAT ANNUAL DUES ARE PAYABLE BEFORE 1 JANUARY 1976

## PHASE III ORBITS


T = 12 HRS. $R_a = 7.12\ r_e$
$h_a = 24{,}213$ smi.
T = 8 HRS. $R_a = 5.14\ r_e$
$h_a = 16{,}379$ smi.
T = 6 HRS. $R_a = 4.03\ r_e$
$h_a = 11{,}988$ smi.
N
Eq.
A
B
S
$t_B - t_A \approx 65$ min
$h_p = 1.228\ r_e = 910$ smi.
$i = 101°$
$\omega = 270°$

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DEADLINE for copy for
next Newsletter is
1 Nov. 1975

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Cover

The three orbits under consideration for the AMSAT-Phase III spacecraft.

## EDITORIAL

Four times a year, your Editor sits down and lays out the Newsletter. The available material is sorted and the Newsletter slowly takes shape. Since the contents of the magazine reflect the material available (and not much is left over each time) you can, by glancing through the last four issues see the kind of material that has been available to me during my first year as Editor. Thus if you desire to see specific material in these pages,you'll have to write it yourself or let us know about it and hopefully we'll find somebody to do the writing.

This is a newsletter. I want to place the emphasis on news. To do so I need more feedback from you the member, for only by receiving your comments on the magazine, and details about your activities can this NEWSLETTER truly reflect and represent AMSAT.

Joe Kasser
G3ZCZ

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## FROM THE PRESIDENT'S DESK

by Perry Klein, K3JTE

This is a plea for those AMSAT-OSCAR 7 users not yet using Mode B (the 432.15-to-145.95 MHz transponder), to make concentrated efforts to do so. For those of you who have been using the two-to-ten meter transponders in AMSAT-OSCAR 6 and 7, you will find the Mode B transponder operation much better in comparison. Signal-to-noise ratios are generally excellent, even at low powers, since the sensitivity is better than with the two-to-ten meter transponders. As a result, stations operating at powers well below 100 watts (EIRP) can do quite well. Signals are also relatively free of fading, and Doppler shift is no problem to compensate for. User statistics compiled to date indicate the countries having the most Mode B users are: W. Germany (70), United States (69), England (25), France (19), Japan (11), Italy and The Netherlands (each 10), and Czechoslovakia (9). Is it possible to draw any conclusions from this?

As many AMSAT-OSCAR 7 users will realize, the spacecraft on occasion has a tendency to "jump modes" spontaneously, especially from Mode A to Mode B (or C). The effect is quite mysterious, often accompanied by resetting of the spacecraft clock and a change of the beacon modulation mode (to, for example, teletype in the AFSK mode or Codestore in the "load" mode). One theory that has been proposed and that would explain this mysterious mode switching is that we are experiencing a static charge buildup around the spacecraft. This high-voltage buildup appears primarily in dielectrics (such as thermal blankets and solar cell cover slips) and can cause arcing, producing transient pulses which affect the operation of the experiment control logic circuits. As far-fetched as this may seem at first glance, considerable attention is being given to verifying this theory by the designers of synchronous satellites, many of whom have been experiencing similar unexplained mode switching with their spacecraft. Data from satellites such as ATS-6 indicate that magnetic substorms can produce charge buildups as high as 10,000 volts as a spacecraft transverses the earth's magnetic field lines.

Here are the known dates that AMSAT-OSCAR 7 mode switching took place:

December 25, 1974 at 1052 GMT (observed)
January 19, 1975 around 0945 GMT (determined from onboard clock)
*February 2, 1975 (time unknown, since onboard clock did not reset)
February 8, 1975 around 0800 GMT (determined from onboard clock)
February 12, 1975 around 1016 GMT (determined from onboard clock)
*February 18, 1975 sometime between 0000 and 2204 GMT
*March 5, 1975 (time unknown, since onboard clock did not reset)
*March 16, 1975 sometime between 0000 and 1300 GMT
*March 24, 1975 (time unknown)
*April 11, 1975 sometime between 1000 and 1200 GMT (determined from clock)
*May 23, 1975 sometime between 0500 and 1100 GMT (clock did not reset)
*June 22, 1975 (time unknown)

We are particularly interested in narrowing down the times of occurrence of mode switching (especially the occasions above denoted with asterisks). If you have observed such a mode jump, please notify us of the details, giving orbit number, date and time, and describing what occurred. This will help us greatly in our analysis.

From observations made so far, it appears that most of the mode switching occurred during the February-March time period, a time when AMSAT-OSCAR 7 received nearly 100% illumination from the sun. It was first thought that perhaps AMSAT-OSCAR 6 commands were getting into the AMSAT-OSCAR 7 command system, especially since the two spacecraft were traveling close together during the February time period. This now appears not to be the case inasmuch as no problem was experienced with mode switching during the July-August period when AMSAT-OSCAR 6 and 7's passes overlapped again.

If this theory of high-voltage buildup and arcing is correct, it might also explain the mechanism responsible for the mysterious noise that has appeared sporadically with the 432.15-to-145.95 MHz Mode B transponder. The effect appears to be somehow geographically related, yet not a function of user activity nor caused by uplink signals or interference sources. If an ionization phenomenon is involved, this might create nonlinearities in the vicinity of the spacecraft antennas, which could produce third-harmonic products, and hence the noise. This theory would also explain why the noise is geographically related, since the high-voltage buildup and discharge is thought to be related to the spacecraft's position with respect to the

(continued on Page 4 )

## Notes on the OSCAR ANTENNA

### Originally Published in the March '75 Newsletter

Most questions are about whether the antenna can be adapted for use on the UPLINK which requires LHCP (Left Hand Circular Polarization) even though it was originally designed for the Telemetry beacon which demands RHCP. As most of my correspondents have concluded, the answer is YES...merely reverse the connections at EITHER dipole...NOT both!! To clarify, the phasing line hookup for the two modes is as follows:

RHCP....Connect A to AA, and B to BB.

LHCP....Connect A to BB, and B to AA.

Further experience with Telemetry reception has shown that the optimum elevation angle (if fixed) is 35° rather that 45° as was originally suggested. This gives you more gain down low on the horizon where you need it to compensate for the path loss, since the satellite is most distant at that time. The drop-off in gain you will experience when the satellite is at high elevation angles (greater than 70°) is more than compensated for by the fact that the satellite is then very close to you, which greatly reduces the path loss. I am now copying better than 97% on the RTTY Telemetry from horizon to horizon with ease, by using the fixed elevation angle of 35°. This is a real benefit, because you certainly don't need the added frustration of trying to adjust the elevation in addition to tuning the receiver to compensate for the Doppler while also rotating the antenna in azimuth.

Some constructors have indicated doubt that the elements would stay aligned if mounted with the specified 1/8" cable clamp...I have had no such difficulty here, but to be doubly sure, I suggest a lock washer (multi-tooth type) be mounted between the clamp and the boom. Another mounting method which may be used is to drill through the boom, and insert the appropriate size 'plastic screw anchor' which is available in practically all hardware and department stores. The anchors are available in many sizes, and the element can be slipped through the center hole after the anchor is pressed into the hole in the boom. This could make for an easy to dismantle portable antenna, if the screw anchors were epoxied to the boom. Insulation quality is of little significance at the center of the elements, since it is a low impedance point.

Apparently the nylon pipe hangers used to mount the dipole are no longer a readily available item. Many other mounting methods have been used and suggested... far too many to recount here. Since the dipole's mounting point is also at low impedance, the mounting method is not critical.

Some builders insist on 'through the boom' metal to metal construction. If this method is utilized, remember to increase all the element lengths by an amount equivalent to 2/3 of the boom's diameter to compensate for the shortening effect of the boom. If you don't like over-hauling antennas every 2 or 3 years, I certainly do NOT recommend the metal to metal construction method.

I have enjoyed and appreciated the correspondence concerning the antenna, and would like to hear from any who have used it.

Good luck, and please note the change in address.

R. R. Dunbar, W0MJS
6012 E. Superior Street
Duluth, MN. 55804

(Continued from Page 3)

earth's magnetic field lines. It would also perhaps explain why the effect seems to be worst in the January-March period of maximum sun, and rarely existent during the June-August months of minimum sun.

We would like to urge AMSAT-OSCAR 7 users, even if you are equipped for Mode B receive-only, to report the exact times that the Mode B noise is observed to come on or off. This will provide useful data from which we can try to correlate the noise incidences with the geographical and geomagnetic position of the spacecraft. It should be emphasized that the theory discussed above is still largely speculative and that much more data will be required before any positive (or negative) conclusions can be drawn.

Perry Klein K3JTE

# DXPEDITION TO SOUTH CAROLINA

by Tom Clark, WA3LND/W0IUF

For some time, we at AMSAT have had the desire to have some packaged, portable satellite terminals available for a number of uses. We are often called on to loan rigs for fellows to put rare states and countries "on the air"; loaner TX-62's and Skyphones have seen yeoman duty in this service in such places as VQ9, KV4, JY New Mexico, Alaska, Idaho, etc., although some of these rigs are privately owned. A special case of this would be the one-shot DXpedition. Another function for packaged, portable rigs would be for demonstrations, whether in the classroom or to governmental dignitaries. The recent Educators Conference sponsored by NASA at the Goddard Space Flight Center is a good example; when some of the Goddard ARC equipment didn't work, my KLM Echo-II and W3GEY's power amplifier were pressed into service at the last minute. A third requirement for packaged rigs is in the area of emergency communications. At the 1971 WARC, the ITU passed a recommendation that called on all governments and satellite builders to plan their systems to be responsive to communications in the event of disasters. The "professionals" have responded by showing "portable" ground terminals with large dishes which cost over $100,000, which require a trained crew and which stretch the definition of the word portable. The amateurs have, on many occasions, provided such communications services, and the Amateur Satellite program, particularly with the advent of the Phase III spacecraft, can carry on our proud tradition. To that end, we have long felt the need for a portable package which would cost around $1000 which could be shown to answer the ITU recommendation and which would be available for use in a disaster. The simulated Alaskan disaster test last year was a good demonstration of our capabilities.

The advent of portable 2m SSB/CW transceivers -- like the KLM Echo-II (Belcom-Liner 2) and the ITC Multi-2000 -- seem to be a natural for such a rig, since they could serve as both an AO6/AO7A exciter and AO7B receiver. Solid-state power amplifiers for 2m are now commonplace, even at power levels in excess of 100w. We understand that KLM even plans a 70cm Echo (Liner-70) to be announced this fall, which could provide AO7B uplink capability. All these components have the advantage that they can be powered from 12VDC, making them ideal for use in the field.

Over a year ago we began seeking a sponsor to help fund the building of such rigs. The Northern California DX Foundation, perhaps most famous for the Kingman Reef DXpedition, came to our rescue with an offer to assist in the development of such a package if they could have one for expedition use which would be under their control. After considerable discussions between W6ISQ, K3JTE and yours truly, the conceptual design for the package started to take shape. For expedition use, a 10m receiver would not be necessary since the HF equipment could serve that function. Both 2m-10m and 70cm-2m capabilities were desirable. In order to minimize antenna size, the 2m transmitter had to run at least 100w output. The 70cm plans are not yet finalized, pending an inspection of the Echo-70 and pending the outcome of some testing of other equipment. The units had to be packaged in a single box that was easy to set up. Maximum use of commercial modules would be stressed to insure compactness, reliability, maintainability and documentation.

Which now brings us to the title of this story. In late May, my wife (she hates to be called XYL) Elizabeth informed me that her relatives in South Carolina had a cottage at the beach for a week in early July and that we would take our vacation then. "Ah ha," thought I. Here is a chance to go off in the boonies and try the portable rig. I already had an Echo-II, so I badgered the local KLM man, W3TMZ (a satellite user of some renown) to loan me one of the KLM 140w linear amplifiers. The antenna for 2m was to be an old 4 element yagi that had been gathering dust in my antenna graveyard, mounted on a camera tripod az-el mount, much as we had discussed with the NCDXF. I couldn't find any suitable mode B equipment on such short notice, so I stayed with 2m-10m only. The power supply was similar to that which I envisioned for the portable package, with a 12v, 20 AH Gell-cell battery; these are lead-acid batteries with a jelly-like acid, which are completely sealed and which can even be sent through the mails legally. This was charged with an ordinary DC supply putting out a couple of amps. I decided to use my "old" call, W0IUF, for the fun of it and because most of the satellite users wouldn't recognize it.

We drove to Elizabeth's parents house in Clinton, SC, arriving late on Saturday night, July 5. I rolled out of bed about 1200Z (8 AM) on Sunday morning, and decided to catch the descending node orbits. The rig was unpacked from the trunk of the car and set up completely in time to catch W4DWN at 1301Z. Walt gave me a 56 report on SSB. The AO6 and AO7 passes on Sunday morning and evening yielded a total of 23 QSO's. Passes to the west were a bit disappointing because I had to look through very heavy foliage to see the satellite.

(continued on page 19)

# AMSAT PHASE III PROGRESS REPORT

by J. A. King, W3GEY

Since the March 20 Experimenter's Meeting all groups are proceeding fairly close to the planned schedule. Most of the hardware design work is being accomplished by AMSAT-DL as planned, and fabrication work on the first flight-quality command decoder is progressing well in Canada. Preliminary work on the ground station equipment (G.S.E.) needed to control the spacecraft is progressing in Australia. A more detailed report, by group, follows:

Project Australis-WIA: The AMSAT-VK group, responsible for the GSE development, have now selected preliminary components for the command and telemetry equipment and have found sources for obtaining most of the components. The basic equipment consists of the PRM command encoder and a noncoherant PCM/PSK telemetry decoder operating in conjunction with an Intel (8008 or 8080) microprocessor. Telemetry and command data will be displayed on a TV terminal and a standard model 33 teletype machine. The teletype will, of course, also be used for entering data in the form of computer programs. Data and programs will be stored in a cassette tape recorder. A preliminary block diagram of the system has been prepared by the Australis group and has been forwarded to all groups for review. This is a good start.

AMSAT-Canada: The artwork for the flight command decoder printed circuit board is nearing completion. Fabrication of a flight-type decoder is expected in the next month. The Canadian group has been working on assembling the ground checkout equipment that will be needed to test the Phase III spacecraft and its subsystems. A PRN command encoder and spacecraft remote power supplies have now been completed and are ready for use.

AMSAT-Deutchland: In accordance with the Phase III program approach the German group is responsible for the engineering design of the spacecraft. They have, thus, been the most active groups since the March meeting.

Karl, DJ4ZC, and his group have worked hard over the past several months and have now completed the command decoder, microprocessor and memory designs, thus completing the Integrated Housekeeping Unit (IHU) portion of the spacecraft. The IHU is fundamental to the Phase III concept and is independent, to a large extent, of the rest of the trade-offs that have to be made. DJ4ZC is responsible for conducting the Phase III trade-off study and considerable progress has been made in this area. The spacecraft structure has been selected to allow the maximum possible size that can be placed into the launch vehicle while maintaining the rotation symmetry and moment of inertia properties important to a spinning satellite. The structure, which is a three cornered star has a reinforced central "tube" which will contain the solid propellant motor. The motor will comprise two thirds of the total spacecraft weight before its ignition and must be well supported to withstand the mechanical loads during launch.

Still to be determined are the exact solar array power requirements, transponder power output and antenna gain since they must be carefully traded one against the other. Figure 1 is a block diagram which provides the most up-to-date information on the systems to be contained in the Phase III satellite. If the transponders have a 50W PEP output then the antenna gain will be on the order of 10dBi, if downlink signals are to be comparable to A-O-7, Mode B.

The transponder frequency selection has now been made. Many comments were received with some in favor of a 145.9 MHz uplink and 435.1 MHz downlink, while others favored 435.1 MHz up and 145.9 MHz down. Considering these factors, AMSAT-DL has notified us that they will make every effort to develop Phase III transponders for both combinations, with the hope that everyone's desires can be accommodated. We wish to thank everyone who provided comments on the frequency selection for taking the time to write and help in this selection. The choice is sure to influence us all for a long time.

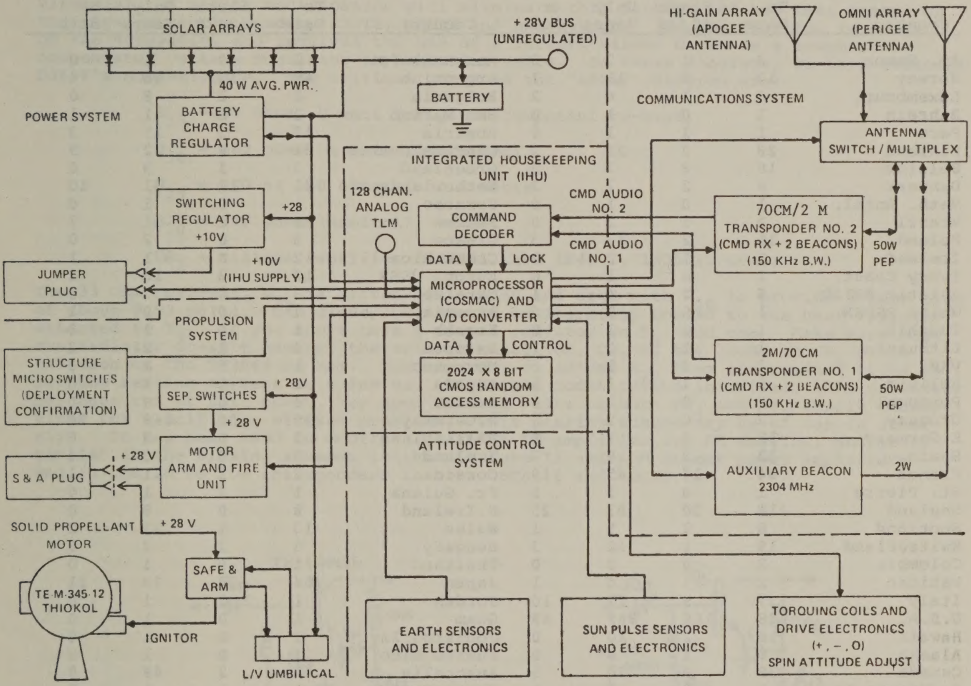
Other tasks still to be looked into are the sensors and magnetic torquing coils for the attitude control system, and the power system components. If all goes well, the preliminary design should be completed by about December of this year.

(Continued on Page 7)

(Continued from Page 6)

San Bernardino Microwave Society (SBMS): Chuck Swedblom, WA6EXV, has completed the breadboard design of a coherent locking S-Band oscillator/amplifier for use as the 2304.1MHz auxiliary beacon. The transmitter should run about 2W output with an efficiency of around 25% once completed. Stability measurements of the oscillator are underway. AMSAT is continuing preparation of supporting documentation for the World Admin. Radio Conference that (hopefully) will assure the use of S-Band and other microwave bands for amateur satellite purposes in 1979.

FIGURE 1 **PHASE - III S/C FUNCTIONAL BLOCK DIAGRAM**


SOLAR ARRAYS
+ 28V BUS (UNREGULATED)
HI-GAIN ARRAY (APOGEE ANTENNA)
OMNI ARRAY (PERIGEE ANTENNA)
40 W AVG. PWR.
BATTERY
POWER SYSTEM
BATTERY CHARGE REGULATOR
COMMUNICATIONS SYSTEM
ANTENNA SWITCH / MULTIPLEX
INTEGRATED HOUSEKEEPING UNIT (IHU)
128 CHAN. ANALOG TLM
CMD AUDIO NO. 2
SWITCHING REGULATOR +10V
+28
COMMAND DECODER
70CM/2 M TRANSPONDER NO. 2 (CMD RX + 2 BEACONS) (150 KHz B.W.)
50W PEP
CMD AUDIO NO. 1
+10V (IHU SUPPLY)
DATA
LOCK
JUMPER PLUG
MICROPROCESSOR (COSMAC) AND A/D CONVERTER
PROPULSION SYSTEM
DATA
CONTROL
STRUCTURE MICROSWITCHES (DEPLOYMENT CONFIRMATION)
2M/70 CM TRANSPONDER NO. 1 (CMD RX + 2 BEACONS) (150 KHz B.W.)
2024 X 8 BIT CMOS RANDOM ACCESS MEMORY
+ 28V
SEP. SWITCHES
50W PEP
+ 28 V
ATTITUDE CONTROL SYSTEM
+ 28 V
S & A PLUG
MOTOR ARM AND FIRE UNIT
AUXILIARY BEACON 2304 MHz
2W
SOLID PROPELLANT MOTOR
+ 28 V
SAFE & ARM
TE-M-345-12 THIOKOL
TORQUING COILS AND DRIVE ELECTRONICS (+, −, O) SPIN ATTITUDE ADJUST
EARTH SENSORS AND ELECTRONICS
SUN PULSE SENSORS AND ELECTRONICS
IGNITOR
L/V UMBILICAL

AMSAT-U.S.A.: AMSAT in Washington is responsible for managing the overall Phase III program, for functional testing of the flight spacecraft and for "procurement" of major space items such as batteries, solar arrays and the boost motor. To date AMSAT has located and supplied several IC's that are now incorporated in the microprocessor of the IHU.

A suitable apogee boost motor has been located and AMSAT is exploring with a major solid propellant motor company obtaining the flight motor and a spare casing for our program. We have also been active in providing research papers and references needed by AMSAT-DL in the trade-off study.

# SUMMARY OF OSCAR ACTIVITY

by R. E. Crumrine, WB2DNN

This summary is based on the QSO reports received at AMSAT. The most significant thing revealed by the following chart is that mode B European activity is almost three times that of North American activity. Actually, not all of North America is accessible to Europe so using only W1,2,3,8,9 and VE1,2,3,4 we find Europeans outnumbering us by more that five to one! Clearly, we are the "rare DX" and Europeans are the "common stuff" on mode B.

| Country | Total Users To Date | New Users Since 10/74 | Total Mode A Only Users | Total Mode B or Both |
|---|---|---|---|---|
| Am. Samoa | 2 | 1 | 2 | 0 |
| Norway | 12 | 2 | 11 | 1 |
| Luxembourg | 6 | 1 | 4 | 2 |
| Bahrein | 1 | 0 | 1 | 0 |
| Peru | 1 | 1 | 1 | 0 |
| Finland | 28 | 2 | 26 | 2 |
| Belgium | 10 | 2 | 7 | 3 |
| Denmark | 9 | 2 | 7 | 2 |
| Neth. Antil. | 1 | 0 | 1 | 0 |
| Brazil | 2 | 1 | 2 | 0 |
| Poland | 16 | 2 | 13 | 3 |
| Iceland | 2 | 1 | 2 | 0 |
| Ivory Coast | 1 | 0 | 1 | 0 |
| Asiatic RSFSR | 5 | 2 | 4 | 1 |
| White RSFSR | 1 | 0 | 1 | 0 |
| Tadzhik | 1 | 0 | 1 | 0 |
| Lithuania | 1 | 1 | 0 | 1 |
| VK0 | 1 | 0 | 1 | 0 |
| Bolivia | 1 | 1 | 1 | 0 |
| Portugal | 2 | 0 | 2 | 0 |
| Uruguay | 2 | 0 | 2 | 0 |
| E.Germany | 12 | 5 | 7 | 5 |
| Spain | 12 | 3 | 9 | 3 |
| France | 84 | 17 | 65 | 19 |
| St. Pierre | 1 | 0 | 1 | 0 |
| England | 118 | 20 | 93 | 25 |
| Scotland | 6 | 1 | 5 | 1 |
| Switzerland | 15 | 1 | 12 | 3 |
| Colombia | 2 | 0 | 2 | 0 |
| Vatican | 1 | 1 | 0 | 1 |
| Italy | 37 | 9 | 27 | 10 |
| U.S.A. | 938 | 166 | 869 | 69 |
| Hawaii | 10 | 2 | 10 | 0 |
| Alaska | 6 | 1 | 6 | 0 |
| Canada | 75 | 9 | 70 | 5 |
| Br.Virgin Is. | 1 | 0 | 1 | 0 |
| St. Lucia | 1 | 0 | 1 | 0 |
| Turks & Caicos Is. | 1 | 0 | 1 | 0 |
| Mexico | 6 | 1 | 6 | 0 |
| Yugoslavia | 16 | 1 | 15 | 1 |
| Gibraltar | 1 | 1 | 1 | 0 |
| Tanganyika | 1 | 0 | 1 | 0 |
| Paraguay | 1 | 0 | 1 | 0 |
| ITU Geneva | 1 | 0 | 1 | 0 |
| Jamaica | 1 | 1 | 0 | 1 |
| Barbados | 1 | 0 | 1 | 0 |
| Marshall Is. | 1 | 0 | 1 | 0 |
| Argentina | 49 | 10 | 45 | 4 |
| Bulgaria | 8 | 2 | 8 | 0 |
| San Marino | 2 | 2 | 1 | 1 |
| Austria | 18 | 3 | 15 | 3 |
| Czechoslovakia | 31 | 9 | 22 | 9 |
| Greenland | 3 | 1 | 3 | 0 |
| Netherlands | 41 | 12 | 31 | 10 |
| Curacao | 1 | 0 | 1 | 0 |
| Sweden | 38 | 8 | 31 | 7 |
| Greece | 2 | 0 | 2 | 0 |
| Costa Rica | 2 | 0 | 1 | 1 |
| Europ. USSR | 12 | 3 | 10 | 2 |
| Ukraine | 3 | 0 | 3 | 0 |
| Armenia | 1 | 0 | 0 | 1 |
| Kazakh | 1 | 0 | 1 | 0 |
| Estonia | 4 | 1 | 2 | 2 |
| Morrocco | 1 | 0 | 1 | 0 |
| Angola | 1 | 0 | 1 | 0 |
| Azores | 4 | 0 | 4 | 0 |
| W.Germany | 239 | 55 | 169 | 70 |
| Philippines | 3 | 0 | 3 | 0 |
| Ireland | 3 | 0 | 3 | 0 |
| Corsica | 2 | 1 | 1 | 1 |
| Fr. Guiana | 1 | 1 | 1 | 0 |
| N.Ireland | 8 | 0 | 8 | 0 |
| Wales | 13 | 1 | 11 | 2 |
| Hungary | 5 | 1 | 2 | 3 |
| Thailand | 1 | 0 | 1 | 0 |
| Japan | 84 | 38 | 73 | 11 |
| Jordan | 1 | 0 | 1 | 0 |
| Guam | 1 | 0 | 1 | 0 |
| Johnston Is. | 1 | 0 | 1 | 0 |
| Puerto Rico | 1 | 0 | 1 | 0 |
| Australia | 49 | 2 | 49 | 0 |
| Montserrat | 1 | 1 | 1 | 0 |
| Bermuda | 3 | 1 | 3 | 0 |
| India | 3 | 0 | 2 | 1 |
| Rumania | 2 | 1 | 2 | 0 |
| Venezuela | 2 | 2 | 2 | 0 |
| Rhodesia | 10 | 0 | 9 | 1 |
| New Zealand | 46 | 0 | 45 | 1 |
| South Africa | 12 | 0 | 12 | 0 |
| W.Samoa | 1 | 0 | 1 | 0 |
| Yemen | 1 | 1 | 1 | 0 |
| Malta | 3 | 2 | 2 | 1 |

These stickers are printed in black on a fluorescent red background. They are pressure sensitive and will stick to anything including QSL cards and envelopes.

AMSAT

They come in sheets of 48 and may be obtained from David Middleton, W7ZC, Box 303, Springdale, Utah 84767, for only $1.25 postpaid.

# Improving the Bias on the DJ6ZZ 432 MHz Transmitting Converter

by Tom Clark, WA3LND/W0IUF

A number of AMSAT-OSCAR 7 Mode B users employ the DJ6ZZ 10m to 70cm transmitting converter which was described in UKW-Berichte/VHF Communications in 1971, and which is available in kit form from the local representatives of that publication. This converter has a reputation for having the 2N3866 output stage self-destruct if the supply voltage exceeds 12 volts (Honorable editor, G3ZCZ, is rumored to have performed such experiments in non-reversible thermodynamics while on a DXpedition to West Virginia). A simple modification will eliminate this problem and has been tested on the rigs currently used by K3JTE, W3GEY and the author. The modification is shown on the schematic, and involves the use of a forward-biased diode as a temperature compensated voltage regulator at about 0.6 volts. In these diagrams, we have followed DJ6ZZ's nomenclature. The critical parts on the "after" diagram are:

$R_{15}$ = 33 ohms, ¼ watt (original component re-used)

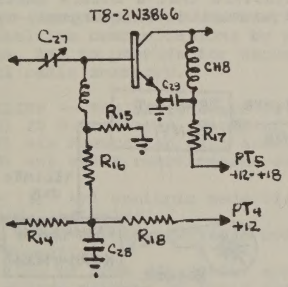
$R_{16}$ = 680 ohms, ¼ watt (discarded)

$R_{19}$ = 470 or 680 ohms, 1 or 2 watts

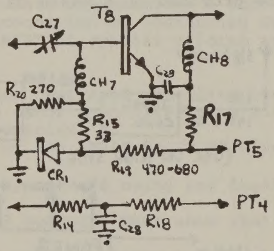
$R_{20}$ = 270 ohms (nominal), ¼ watt

$CR_1$ = silicon rectifier (1N4001 thru 1N4007, 1N2071, etc.)

The 33 Ohm resistor, $R_{15}$ is lifted off ground and used with $R_{20}$ to provide a base bias of about 0.53 volts. The diode, $CR_1$ should be thermally bonded to the heat radiator attached to $T_8$. If you don't have a finned radiator on $T_8$, add one. Make sure that the radiator doesn't contact the trimmer capacitor, $C_{27}$ or the leads on $CR_1$ since the case on the 2N3866 in hot. You may want to adjust $R_{20}$ from its nominal value to set the resting current to a few ma. With this modification installed, this converter has been run at full power, key down with 15 volts on both $PT_4$ and $PT_5$ supply connections for a half hour with no problems. This biasing scheme may be of use in other rigs. It has been used to modify a Heathkit FM amplifier for FM service, and it is similar to the biasing schemes in the KLM Echo-II and KLM Linear power amplifiers and in the 2m to 10m transponders in both OSCAR 6 and OSCAR 7.



BEFORE



AFTER

# OSCAR 7B MOBILE EXPERIMENT

by Fred Merry, W2GN

The excellent signals observed through OSCAR 7B with relatively low power on the uplink provided an irresistable urge to give it a try mobile.

The sketch shows the equipment line-up which was selected and installed. The xtal in the converter is on the high side of the signal to re-invert (restore) the pass-band to normal on the downlink. Transceive operation is obtained by pulling the receive converter xtal to the proper frequency. The capacitor has a vernier dial to facilitate this adjustment. The same control is used to follow the doppler; the transceiver dial being left alone during a QSO.

The installation was thoroughly checked out on the bench and in the shack before installation in the car. It is important to know where to set the tuning of the receive converter so that the transmit/receive are tracking through the satellite over the period of the pass. The FT101 and the receive converter were installed in the front of the car. The balance of the equipment was installed in the trunk.

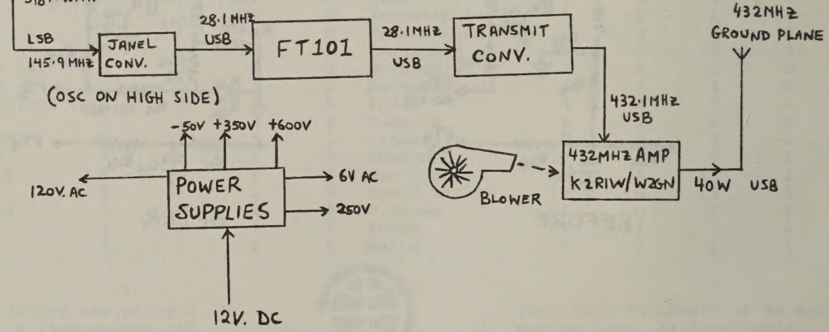
The first orbit available (2229B) after the installation was tried from the garage driveway. The immediate success was somewhat disconcerting as we engaged in a practically solid SSB QSO with W2BXA for 13 minutes of the pass.

This initial operation was followed by special tests authorized by AMSAT on orbits 2253B, 2254B and 2255B. During 2253B and 2254B, consistent SSB contact was extablished, alternately, with W8DX and K8MYN. There was also a QSO with W9ERC who was on CW. During the entire 2254B orbit, the car was in motion, in a residential area relatively free of traffic, with no observable difference in communication.

After this special test, a number of additional orbits were used to demonstrate that relatively simple antennas and low power will provide effective communication through OSCAR 7B. Orbits and stations worked: Orbit 2272B: W9AAG, W9OII, W3TMZ, W8DX, W4MOP. 2278B: PA0DBQ, WA0PVV, W4MOP, W8DX, W2BXA. 2297B: W8DX, WB2VKZ, W5SXB, WA6UAP, K8MYN. 2303B: W2BXA, K2ZRO. 2304B: WB2VKZ. 2322: W3RUE, W9TGB. 2328: G3ILD, W2BLV, W1WM.

Transceive operation, while effective, does take away from the satellite operating experience because you can't hear your downlink signal.

The equipment used in this experiment was of the fixed station type, adapted for mobile operation. As 12 volt solid-state SSB equipment becomes available for 432, mobile operation via OSCAR 7B will be quite practical and should become more or less routine. It is not far-fetched to conjecture that a future amateur satellite might be provided on a basis of restriction to mobile and emergency operation.



Equipment at W2GN/mobile

Fred Merry, W2GN
35 Highland Drive
East Greenbush, New York 12061

## AMSAT-OSCAR 7 SLIDE COLLECTIONS

Slide collections covering the construction, test and launch of AMSAT-OSCAR 7 are now available. These sets of 21 slides, complete with detailed slide descriptions, may be ordered for $5.40 postpaid (or 28 IRC's) from Norman Chalfin, K6PGX, P. O. Box 463, Pasadena, Calif. 91102. Make payments payable to Norman Chalfin. All excess procees over costs will go to AMSAT. (overseas airmail price $7.48 or 40 IRC's)

AMSAT-OSCAR 7 Slide Titles:

1. WA4DGU constructing the two-to-ten meter transponder.
2. Two-to-ten meter transponder before encapsulation.
3. 70cm-to-2m transponder receiver.
4. 70cm-to-2m transponder transmitter.
5. 70cm-to-2m transponder modulator.
6. Command decoder.
7. Wiring harness.
8. Spacecraft interior.
9. Spacecraft with solar panels in place.
10. 435.1 MHz beacon transmitter.
11. Morse code telemetry encoder.
12. Experiment control logic.
13. Battery charge regulator.
14. Nickel-cadmium battery.
15. Hybrid/diplexer module.
16. K3JTE, K6GSJ, W5CAY, DJ4ZC, K6HIJ, VK3ZPI and W3GEY at Experimenters Meeting.
17. Vibration test.
18. Installation in the Delta launch vehicle.
19. Spacecraft after installation in launch vehicle.
20. Launch!
21. Figure "7" drawn in the sky following launch.

## OSCAR SATELLITE COMMUNICATIONS ACHIEVEMENT RECOGNITION

### NEW SATELLITE OPERATING AWARD

AMSAT is now handing out "OSCARs." AMSAT announces a new operating award for satellite users, details as follows:

PURPOSE -- The purpose of the award is to stimulate and maintain a continuing interest in satellite communications by providing recognition of continuing QSO accomplishments, AND to provide for recognition by AMSAT of special efforts and services by all radio amateurs.

AVAILABILITY -- The basic award is available for confirmed satellite contacts with either (1) 20 U.S. states, Canadian call areas, other countries, or a mixture thereof, or (2) six Australian call areas and two countries, or
(3) any other requirements as specified by the AMSAT Board of Directors.

NOTES -- (1) All contacts made via any OSCAR spacecraft using any legal transmission mode are valid.

(2) QSL cards or other written confirmation of contacts must show that the QSO was via a satellite.

(3) In lieu of such QSL cards, applicants may submit a list of contacts confirmed by the awards manager of their national amateur radio society or AMSAT affiliate organization.

(4) All contacts must be made from the same QTH (within an area of 25 miles from a particular location).

(5) Sufficient postage must be supplied for the return of the QSL cards sent. The award is free to AMSAT members, and is available to nonmembers for the nominal fee of $1.00. Please include your membership number.

(6) Endorsements are now available for each ten (10) additional areas as defined in section (1) above.

(7) Send applications to AMSAT-Award Program, Box 27, Washington, D.C. 20044, U.S.A.

We are pleased to announce that Earl Skelton, WA3THD, has agreed to serve as Award Manager in administering the "OSCAR" Award.

# AMSAT-OSCAR REFERENCE ORBITS AND OPERATING SCHEDULE

## AMSAT-OSCAR 6

Period = 114.99449 minutes

Increment = 28.7486 deg/orbit

Inclination = 101.6015 degrees

### Operating Schedule

2/10 ON (GMT Days)
EVENINGS
  Monday, Thursday, Saturday
MORNINGS
  Sunday (EVEN DAYS, Educational demonstrations only)

## AMSAT-OSCAR 7

Period = 114.94478 minutes

Increment = 28.7362 deg/orbit

Inclination = 101.7010 degrees

### Operating Schedule

EVEN DAYS of year  Mode B
ODD DAYS of year  Mode A
WEDNESDAYS (Experiment and Bulletin use only. General communications not permitted. Days designated below by "X".)

## AMSAT-OSCAR 6

| ORBIT | DATE | TIME(Z) | LONG W |
|---|---|---|---|
| 13153 | 1 SEP | 0112.91 | 69.26 |
| 13165 | 2 SEP | 0012.85 | 54.24 |
| 13178 | 3 SEP | 0107.78 | 67.97 |
| 13190 | 4 SEP | 0007.71 | 52.96 |
| 13203 | 5 SEP | 0102.64 | 66.69 |
| 13215 | 6 SEP | 0002.57 | 51.67 |
| 13228 | 7 SEP | 0057.50 | 65.40 |
| 13241 | 8 SEP | 0152.43 | 79.13 |
| 13253 | 9 SEP | 0052.36 | 64.12 |
| 13266 | 10 SEP | 0147.29 | 77.85 |
| 13278 | 11 SEP | 0047.22 | 62.83 |
| 13291 | 12 SEP | 0142.15 | 76.56 |
| 13303 | 13 SEP | 0042.09 | 61.55 |
| 13316 | 14 SEP | 0137.02 | 75.28 |
| 13328 | 15 SEP | 0036.95 | 60.26 |
| 13341 | 16 SEP | 0131.88 | 73.99 |
| 13353 | 17 SEP | 0031.81 | 58.98 |
| 13366 | 18 SEP | 0126.74 | 72.71 |
| 13378 | 19 SEP | 0026.67 | 57.69 |
| 13391 | 20 SEP | 0121.60 | 71.42 |
| 13403 | 21 SEP | 0021.54 | 56.41 |
| 13416 | 22 SEP | 0116.46 | 70.14 |
| 13428 | 23 SEP | 0016.40 | 55.12 |
| 13441 | 24 SEP | 0111.33 | 68.85 |
| 13453 | 25 SEP | 0011.26 | 53.84 |
| 13466 | 26 SEP | 0106.19 | 67.57 |
| 13478 | 27 SEP | 0006.12 | 52.55 |
| 13491 | 28 SEP | 0101.05 | 66.28 |
| 13503 | 29 SEP | 0000.99 | 51.27 |
| 13516 | 30 SEP | 0055.91 | 65.00 |
| 13529 | 1 OCT | 0150.84 | 78.73 |
| 13541 | 2 OCT | 0050.78 | 63.71 |
| 13554 | 3 OCT | 0145.70 | 77.45 |
| 13566 | 4 OCT | 0045.64 | 62.43 |
| 13579 | 5 OCT | 0140.57 | 76.16 |
| 13591 | 6 OCT | 0040.50 | 61.14 |
| 13604 | 7 OCT | 0135.43 | 74.88 |
| 13616 | 8 OCT | 0035.36 | 59.86 |
| 13629 | 9 OCT | 0130.29 | 73.59 |
| 13641 | 10 OCT | 0030.22 | 58.57 |
| 13654 | 11 OCT | 0125.15 | 72.31 |
| 13666 | 12 OCT | 0025.09 | 57.29 |
| 13679 | 13 OCT | 0120.02 | 71.02 |
| 13691 | 14 OCT | 0019.95 | 56.00 |
| 13704 | 15 OCT | 0114.88 | 69.74 |
| 13716 | 16 OCT | 0014.81 | 54.72 |
| 13729 | 17 OCT | 0109.74 | 68.45 |
| 13741 | 18 OCT | 0009.67 | 53.43 |
| 13754 | 19 OCT | 0104.60 | 67.17 |
| 13766 | 20 OCT | 0004.54 | 52.15 |

## AMSAT-OSCAR 7

| ORBIT | DATE | TIME(Z) | LONG W |
|---|---|---|---|
| 3625B | 1 SEP | 0055.89 | 63.82 |
| 3638A | 2 SEP | 0150.17 | 77.39 |
| 3650X | 3 SEP | 0049.51 | 62.23 |
| 3663A | 4 SEP | 0143.79 | 75.80 |
| 3675B | 5 SEP | 0043.13 | 60.63 |
| 3688A | 6 SEP | 0137.41 | 74.20 |
| 3700B | 7 SEP | 0036.75 | 59.04 |
| 3713A | 8 SEP | 0131.03 | 72.61 |
| 3725B | 9 SEP | 0030.37 | 57.44 |
| 3738X | 10 SEP | 0124.65 | 71.01 |
| 3750B | 11 SEP | 0023.99 | 55.85 |
| 3763A | 12 SEP | 0118.27 | 69.42 |
| 3775B | 13 SEP | 0017.61 | 54.25 |
| 3788A | 14 SEP | 0111.89 | 67.82 |
| 3800B | 15 SEP | 0011.23 | 52.66 |
| 3813A | 16 SEP | 0105.51 | 66.23 |
| 3825X | 17 SEP | 0004.85 | 51.06 |
| 3838A | 18 SEP | 0059.13 | 64.63 |
| 3851B | 19 SEP | 0153.41 | 78.20 |
| 3863A | 20 SEP | 0052.75 | 63.04 |
| 3876B | 21 SEP | 0147.03 | 76.61 |
| 3888A | 22 SEP | 0046.37 | 61.44 |
| 3901B | 23 SEP | 0140.65 | 75.01 |
| 3913X | 24 SEP | 0039.99 | 59.85 |
| 3926B | 25 SEP | 0134.27 | 73.42 |
| 3938A | 26 SEP | 0033.61 | 58.25 |
| 3951B | 27 SEP | 0127.89 | 71.82 |
| 3963A | 28 SEP | 0027.22 | 56.66 |
| 3976B | 29 SEP | 0121.51 | 70.23 |
| 3988A | 30 SEP | 0020.84 | 55.06 |
| 4001X | 1 OCT | 0115.13 | 68.63 |
| 4013A | 2 OCT | 0014.46 | 53.47 |
| 4026B | 3 OCT | 0108.75 | 67.04 |
| 4038A | 4 OCT | 0008.08 | 51.87 |
| 4051B | 5 OCT | 0102.37 | 65.44 |
| 4063A | 6 OCT | 0001.70 | 50.28 |
| 4076B | 7 OCT | 0055.98 | 63.85 |
| 4089X | 8 OCT | 0150.27 | 77.42 |
| 4101B | 9 OCT | 0049.60 | 62.25 |
| 4114A | 10 OCT | 0143.89 | 75.82 |
| 4126B | 11 OCT | 0043.22 | 60.66 |
| 4139A | 12 OCT | 0137.51 | 74.23 |
| 4151B | 13 OCT | 0036.84 | 59.06 |
| 4164A | 14 OCT | 0131.13 | 72.63 |
| 4176X | 15 OCT | 0030.46 | 57.47 |
| 4189A | 16 OCT | 0124.74 | 71.04 |
| 4201B | 17 OCT | 0024.08 | 55.87 |
| 4214A | 18 OCT | 0118.36 | 69.44 |
| 4226B | 19 OCT | 0017.70 | 54.28 |
| 4239A | 20 OCT | 0111.98 | 67.85 |

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Please indicate here if you have made one or more contacts with AMSAT-OSCAR 6 ☐;
AMSAT-OSCAR 7 Mode A ☐; AMSAT-OSCAR 7 Mode B ☐

Membership dues for the calendar year........................................$10.00
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Life Membership (donation of $100 or more)...........................$________
An AMSAT-OSCAR Satellite Pin Provided to New Life Members

A-O-6 / A-O-7 Orbit Calendar (@ $3 each) (indicate year:\_\_\_\_\_\_\_)..............$________
(Provided free to new Life Members)

# SPACECRAFT TRANSPONDER FREQUENCIES

| SPACECRAFT | UPLINK | DOWNLINK | BEACON |
|---|---|---|---|
| A-O-6 | 145.90 - 146.00 MHz | 29.45 - 29.55 MHz | 29.45 MHz |
| A-O-7 | | | |
| (Mode A) | 145.85 - 145.95 MHz | 29.40 - 29.50 MHz | 29.502 MHz |
| (Mode B/C) | 432.125 - 432.175 MHz | 145.975 - 145.925 MHz | 145.972 MHz |
| (Mode A/D) | - | - | 435.10 MHz |

| AMSAT-OSCAR 6 | | | | AMSAT-OSCAR 7 | | | |
|---|---|---|---|---|---|---|---|
| ORBIT | DATE | TIME(Z) | LONG W | ORBIT | DATE | TIME(Z) | LONG W |
| 13779 | 21 OCT | 0059.46 | 65.88 | 4251B | 21 OCT | 0011.32 | 52.68 |
| 13792 | 22 OCT | 0154.39 | 79.61 | 4264X | 22 OCT | 0105.60 | 66.25 |
| 13804 | 23 OCT | 0054.33 | 64.60 | 4276B | 23 OCT | 0004.94 | 51.09 |
| 13817 | 24 OCT | 0149.26 | 78.33 | 4289A | 24 OCT | 0059.22 | 64.66 |
| 13829 | 25 OCT | 0049.19 | 63.31 | 4302B | 25 OCT | 0153.51 | 78.23 |
| 13842 | 26 OCT | 0144.12 | 77.04 | 4314A | 26 OCT | 0052.84 | 63.06 |
| 13854 | 27 OCT | 0044.05 | 62.03 | 4327B | 27 OCT | 0147.12 | 76.63 |
| 13867 | 28 OCT | 0138.98 | 75.76 | 4339A | 28 OCT | 0046.46 | 61.47 |
| 13879 | 29 OCT | 0038.91 | 60.74 | 4352X | 29 OCT | 0140.74 | 75.04 |
| 13892 | 30 OCT | 0133.84 | 74.47 | 4364A | 30 OCT | 0040.08 | 59.87 |
| 13904 | 31 OCT | 0033.78 | 59.46 | 4377B | 31 OCT | 0134.36 | 73.44 |
| 13917 | 1 NOV | 0128.70 | 73.19 | 4389A | 1 NOV | 0033.70 | 58.28 |
| 13929 | 2 NOV | 0028.64 | 58.17 | 4402B | 2 NOV | 0127.98 | 71.85 |
| 13942 | 3 NOV | 0123.57 | 71.90 | 4414A | 3 NOV | 0027.32 | 56.68 |
| 13954 | 4 NOV | 0023.50 | 56.89 | 4427B | 4 NOV | 0121.60 | 70.25 |
| 13967 | 5 NOV | 0118.43 | 70.62 | 4439X | 5 NOV | 0020.94 | 55.09 |
| 13979 | 6 NOV | 0018.36 | 55.60 | 4452B | 6 NOV | 0115.22 | 68.66 |
| 13992 | 7 NOV | 0113.29 | 69.33 | 4464A | 7 NOV | 0014.56 | 53.49 |
| 14004 | 8 NOV | 0013.22 | 54.32 | 4477B | 8 NOV | 0108.84 | 67.06 |
| 14017 | 9 NOV | 0108.15 | 68.05 | 4489A | 9 NOV | 0008.18 | 51.90 |
| 14029 | 10 NOV | 0008.09 | 53.03 | 4502B | 10 NOV | 0102.46 | 65.47 |
| 14042 | 11 NOV | 0103.02 | 66.76 | 4514A | 11 NOV | 0001.80 | 50.30 |
| 14054 | 12 NOV | 0002.95 | 51.75 | 4527X | 12 NOV | 0056.08 | 63.87 |
| 14067 | 13 NOV | 0057.88 | 65.48 | 4540A | 13 NOV | 0150.36 | 77.45 |
| 14080 | 14 NOV | 0152.81 | 79.21 | 4552B | 14 NOV | 0049.70 | 62.28 |
| 14092 | 15 NOV | 0052.74 | 64.19 | 4565A | 15 NOV | 0143.98 | 75.85 |
| 14105 | 16 NOV | 0147.67 | 77.92 | 4577B | 16 NOV | 0043.32 | 60.68 |
| 14117 | 17 NOV | 0047.60 | 62.91 | 4590A | 17 NOV | 0137.60 | 74.26 |
| 14130 | 18 NOV | 0142.53 | 76.64 | 4602B | 18 NOV | 0036.94 | 59.09 |
| 14142 | 19 NOV | 0042.46 | 61.62 | 4615X | 19 NOV | 0131.22 | 72.66 |
| 14155 | 20 NOV | 0137.39 | 75.35 | 4627B | 20 NOV | 0030.56 | 57.49 |
| 14167 | 21 NOV | 0037.33 | 60.34 | 4640A | 21 NOV | 0124.84 | 71.07 |
| 14180 | 22 NOV | 0132.25 | 74.07 | 4652B | 22 NOV | 0024.18 | 55.90 |
| 14192 | 23 NOV | 0032.19 | 59.05 | 4665A | 23 NOV | 0118.46 | 69.47 |
| 14205 | 24 NOV | 0127.12 | 72.78 | 4677B | 24 NOV | 0017.80 | 54.30 |
| 14217 | 25 NOV | 0027.05 | 57.77 | 4690A | 25 NOV | 0112.08 | 67.88 |
| 14230 | 26 NOV | 0121.98 | 71.50 | 4702X | 26 NOV | 0011.42 | 52.71 |
| 14242 | 27 NOV | 0021.91 | 56.48 | 4715A | 27 NOV | 0105.70 | 66.28 |
| 14255 | 28 NOV | 0116.84 | 70.21 | 4727B | 28 NOV | 0005.04 | 51.11 |
| 14267 | 29 NOV | 0016.78 | 55.20 | 4740A | 29 NOV | 0059.32 | 64.69 |
| 14280 | 30 NOV | 0111.70 | 68.93 | 4753B | 30 NOV | 0153.60 | 78.26 |
| 14292 | 1 DEC | 0011.64 | 53.91 | 4765A | 1 DEC | 0052.94 | 63.09 |
| 14305 | 2 DEC | 0106.57 | 67.64 | 4778B | 2 DEC | 0147.22 | 76.66 |
| 14317 | 3 DEC | 0006.50 | 52.63 | 4790X | 3 DEC | 0046.56 | 61.50 |
| 14330 | 4 DEC | 0101.43 | 66.36 | 4803B | 4 DEC | 0140.84 | 75.07 |
| 14342 | 5 DEC | 0001.36 | 51.34 | 4815A | 5 DEC | 0040.18 | 59.90 |
| 14355 | 6 DEC | 0056.29 | 65.07 | 4828B | 6 DEC | 0134.46 | 73.47 |
| 14368 | 7 DEC | 0151.22 | 78.81 | 4840A | 7 DEC | 0033.80 | 58.31 |
| 14380 | 8 DEC | 0051.15 | 63.79 | 4853B | 8 DEC | 0128.08 | 71.88 |
| 14393 | 9 DEC | 0146.08 | 77.52 | 4865A | 9 DEC | 0027.42 | 56.71 |
| 14405 | 10 DEC | 0046.02 | 62.50 | 4878X | 10 DEC | 0121.70 | 70.28 |
| 14418 | 11 DEC | 0140.94 | 76.24 | 4890A | 11 DEC | 0021.04 | 55.12 |
| 14430 | 12 DEC | 0040.88 | 61.22 | 4903B | 12 DEC | 0115.32 | 68.69 |
| 14443 | 13 DEC | 0135.81 | 74.95 | 4915A | 13 DEC | 0014.66 | 53.52 |
| 14455 | 14 DEC | 0035.74 | 59.93 | 4928B | 14 DEC | 0108.94 | 67.09 |
| 14468 | 15 DEC | 0130.67 | 73.67 | 4940A | 15 DEC | 0008.27 | 51.93 |
| 14480 | 16 DEC | 0030.60 | 58.65 | 4953B | 16 DEC | 0102.56 | 65.50 |
| 14493 | 17 DEC | 0125.53 | 72.38 | 4965X | 17 DEC | 0001.89 | 50.33 |
| 14505 | 18 DEC | 0025.46 | 57.36 | 4978B | 18 DEC | 0056.18 | 63.90 |
| 14518 | 19 DEC | 0120.39 | 71.10 | 4991A | 19 DEC | 0150.46 | 77.47 |
| 14530 | 20 DEC | 0020.33 | 56.08 | 5003B | 20 DEC | 0049.80 | 62.31 |

# PERPETUAL COMPUTER PRINTOUT AVAILABLE FOR AMSAT-OSCAR 6 AND 7

by William Johnston, WB5CBC

Many of those who obtained my AMSAT-OSCAR 6 orbital prediction computer printouts subsequently requested similar printouts for AMSAT-OSCAR 7 and/or updates for OSCAR 6. Since the project was discontinued some time ago, it was not possible to fill those requests.

At the present time, however, I can supply an alternative system, which is actually superior in most respects. It can be used for both AMSAT-OSCAR 6 and AMSAT-OSCAR 7, and is good for the life of the satellites, so that it does not become obsolete or outdated. Furthermore, if future OSCAR satellites are put in the same orbit as AMSAT-OSCAR 6 and 7, you will be able to use the printout for them also.

The system consists of a computer printout, generated for your exact QTH, showing time, azimuth angle, elevation angle, and range (all printed out at 1-minute time intervals). A complete table is printed out for every possible equator crossing (in longitude increments of 1 degree). The actual printout runs 66 lines to a page, and will have from 60 to 110 pages, depending upon the latitude and longitude of your QTH. This printout is somewhat larger than the one supplied with the previous system.

Starting with the time and longitude of equator crossing for the orbit you want to use, you look in the printout for the table under that longitude. This gives you full data (time, azimuth, elevation, range), at intervals of 1 minute, for the complete pass. The times listed are the number of minutes to add to the time of equator crossing, giving the exact time of day for each point.

You must, of course, have the time and longitude of equator crossing for the particular orbit you are interested in. Some publications (such as "HR Report") include monthly listings of this data for every orbit. Other publications (plus the regular ARRL W1AW transmissions) give the information for only selected "reference orbits," leaving it to the user to calculate the figures for the intermediate orbits.

For the benefit of those who receive the information for only periodic reference orbits, another chart is included which gives the figures to add to any given reference orbit, to yield the time and longitude of the orbit you want, up to 120 orbits (about 10 days) beyond the reference orbit. If your reference data is older than this, you can increment the time and longitude of the reference orbit directly, or by multiples of the chart entries.

In any case, as long as you receive occasional published or transmitted reference orbit data, you can quickly and easily arrive at the time and longitude of the crossing of any desired orbit, and refer to the large printout for the detailed data for the pass.

The cost of the package is as follows:

| U.S.A., CANADA and MEXICO | OTHER COUNTRIES |
|---|---|
| $3.25 by Third Class Mail | $3.25 by Surface Mail |
| $3.75 by First Class Mail | $4.50 by Air Mail |
| $4.00 by Air Mail | |

Please include the following information when ordering:

1. Name
2. Mailing Address
3. Location for which you want the printout (if less than 10,000 population, please include latitude and longitude, or carefully describe location with respect to other nearby larger towns).
4. Remittance as described above. Preferred method is by check (personal or bank cheque) or money order, in U.S. funds. If you must send cash, please use registered mail. If you are unable to obtain a cheque in U.S. funds, you may send a cheque in foreign funds equivalent to the U.S. $ cost listed above, or IRC's (at the rate of 5½ IRC's per dollar).

Send to: WB5CBC, Bill Johnston, 1808 Pomona Drive, Las Cruces, New Mexico, U.S.A., 88001. Payment should be made payable to William Johnston.

# HOW TO USE THE PERPETUAL ORBITAL PREDICTION PRINTOUT

# FOR AMSAT-OSCAR 6 AND 7

by William Hohnston, WB5CBC

This printout is good for the life of the satellites, and does not become obsolete or outdated. It is also good for any future satellites put into the same orbit.

Although the instructions which follow are fairly detailed, the system is quite simple to use. Briefly stated, you start with the longitude of equator crossing and go to that section in the printout. Each line in the printout has a time in minutes which you add to the time of the equator crossing giving you the exact time of day at any point in the pass. Along with each given time is listed the azimuth angle, elevation angle, and range.

The detailed instructions are primarily for those who have no previous experience with the satellites, but you will find it useful to read through them in any case.

The printout is organized into a series of sections or tables, each of which is referenced to a different equator crossing of the satellite. These tables appear for every 1 degree of longitude, from 0° to 359°. This refers to West longitude, and is the usual way of referencing satellite orbits. Only those equator crossings which result in passes which are accessible from your QTH are listed. Crossings which do not have a usable pass for your QTH do not appear on the printout.

"Equator crossing" is always taken to mean the point at which the satellite crosses the equator, traveling northbound. The technical term for this event or point is the "ascending node," and it is the point at which published reference data is based on. (The terms ascending and descending pass simply refer to the direction of travel of the satellite when it passes through your area of accessibility.)

Within each section or table in the printout, there is complete data on time, azimuth angle, elevation angle, and range, printed out at every one-minute interval of time. The times are referenced to the time of equator crossing, and represent the number of minutes to be added to the time of crossing to yield the exact time of any given point in the pass. A negative time indicates minutes to be subtracted from the time of equator crossing. (The only printouts that will ever contain any negative times are those for locations within about 35.5 degrees of the equator, since only those locations can sight the satellite on both sides of the equator.)

The azimuth angle is listed in degrees from true north (0°), measured in a clockwise direction.

The elevation angle is measured in degrees, from 0° (directly on the horizon) to 90° (directly overhead). An occasional negative elevation angle may be listed (-1 or -2 degrees), which indicates that the satellite is slightly below the horizon. There may be occasional propagation conditions enabling you to hear the satellite in these slightly below-the-horizon positions.

The range, listed in kilometers, is the line of sight distance from the station QTH to the satellite. To use the printout, you start with the time and longitude of equator crossing of the orbit you want to use. Suppose, for example, you plan to use an orbit that crosses the equator at 63 degrees at 16:21 GMT. You first go to the section in the printout for that longitude, labeled "EQ CROSSING AT 63 DEG LONG." (If there is no section listed for that longitude, the satellite will not be usable from your QTH for that orbit.)

Now, suppose the first entry in that table has a time of 7, azimuth 123, and elevation 0. This means that 7 minutes after equator crossing, the satellite will be at an azimuth of 123°, just as it appears on the horizon (elevation 0°). The exact time, then, 16:21 GMT plus 7 minutes, or 16:28 GMT.

The same method is used for any point in the pass. Just add the number of minutes shown (or subtract if it's a negative number) to the time of equator crossing, for the exact time of day throughout the pass. You may find it easier to jot these times down before the pass starts, so that you won't have to do it during the pass itself, and you may prefer to use local time rather than GMT.

Don't forget to convert minutes to hours whenever the number of minutes goes over 59. For example, you might have a crossing time of 21:48 GMT, and add a table entry of 31 minutes to get 21:79, which is actually 22:19 GMT, of course. Notice also

(Continued on Page 16)

(Continued from Page 15)

that the times listed are always in minutes, and these times can exceed 59 minutes, expecially on printouts made for QTH's in the Southern Hemisphere. This makes no difference in the method, since you still add the number to the time of crossing. As an example, suppose you had a crossing time of 11:57 GMT, and a time from the chart of 129 minutes. By adding, you get 11:186, which is 14:06 GMT, since 186 minutes is 3 hours and 6 minutes.

Actually, you really need to do the addition for only the first point in the table, and after that you simply increment the time by 1 minute for each new entry.

Since some QTH's can see the satellite on both sides of the equator, and since the orbit number officially changes at the northbound equator crossing, you may find some passes listed twice, for all practical purposes. For example, there could be an entry showing the satellite coming into view well into the orbit (90 minutes or more after equator crossing), and all the data for the complete pass will be listed. (The last time for the pass could be as high as 139 minutes.) What is happening here is that a new orbit starts during the pass, at the point of northbound equator crossing (at the time entry of 115 minutes). This equator crossing is 29 degrees further along than the one listed for the table you are presently looking at. So, if you were to add 29 degrees to the equator crossing you just looked up, and then look up the table for that crossing, you would find data corresponding to what is essentially the same pass, but starting with negative times. Of course, no matter which equator crossing you use as reference, you must start with the correct time of day for that crossing. The result is that the two different entries of the type described above, will yield identical data. (There may be occasional slight differences, since the orbital increment is actually slightly less than 29 degrees.) This is simply an added feature of printout, which gives you the option of looking up the pass, starting at the end of one official orbit, or starting at the beginning of the next official orbit 29 degrees of longitude later.

The conditions just described do not exist for every pass (only for a few), and in any case can exist only for QTH's within about 35.5 degrees of the equator.

As mentioned previously, the printout is good for the life of the satellites, requiring only that you have the time and longitude of equator crossing for the orbit you want to use.

Some publications (such as "HR Report") publish a monthly chart with the time and longitude of every equator crossing for the entire month, for both OSCAR 6 and 7. If you receive a publication of this type, you simply take the figures directly from the chart for the orbit you want. The longitude tells you which table to use in the printout, and the time is the time to which you add the number of minutes listed in the table entries.

Other publications (such as the "AMSAT Newsletter," for example), plus the regular W1AW transmissions give the data only for selected "reference orbits." This is normally one orbit per day, usually the first orbit in the day (GMT). The task of computing the times and longitudes of the intermediate orbits is left up to you. This is actually no problem, though, since both the length of time of an orbit, and the number of degrees along the equator separating consecutive crossings always remains constant for a given satellite. Consequently, if you know these constant figures and the time and longitude of any one equator crossing, you can find the time and longitude of any other equator crossing simply by incrementing from the reference orbit with the constant figures.

The constant figures used in the WB5CBC program are as follows:

| AMSAT-OSCAR 6 | AMSAT-OSCAR 7 |
|---|---|
| 114.99454 minutes/orbit | 114.944676 minutes/orbit |
| 28.74864 degrees/orbit | 28.73617 degrees/orbit |

Unless you plan to increment over a long period of time, one decimal place is sufficient accuracy.

As an example, suppose you have a reference orbit listed showing equator crossing at 18:36 GMT, at 53.2 degrees longitude. The next equator crossing would be 115 minutes (1 hour 55 minutes) and 28.7 degrees later, which comes out to 20:31 GMT at 81.9 degrees longitude. The next crossing would be at 22:26 GMT at 110.6 degrees longitude, and so forth.

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Included with the printout is a chart which already has the increments added up. So if you want to know the time and longitude at, say, 6 orbits after the reference orbit, you simply look on that line and it tells you how much time and longitude to add to the reference figures. In the case of this example (6 orbits after reference orbit), for AMSAT-OSCAR 6, the chart shows that you would add 11 hours and 30 minutes to the time of the reference crossing, and 172.5 degrees to the longitude.

After you do the additions, don't forget to convert minutes to hours when the number of minutes goes over 59, and if necessary, convert hours to days if the number of hours goes over 24. Also, if the longitude goes over 360 degrees, subtract 360 degrees from the figure. For example, if you come up with 431 degrees, subtract 360 to get the final answer of 71 degrees.

The individual entries in the chart already have these conversions done, and it is only when you add a chart entry to a reference orbit figure that you may have to convert minutes to hours, etc.

## AMSAT NETS

The following AMSAT Nets meet regularly to disseminate information to newcomers and to keep regular satellite users in communication with one another.

| | | | | |
|---|---|---|---|---|
| USA-East Coast Net | Tuesdays | 9:00PM EDT | 3850kHz LSB | Net Control W3ZM or W3UN |
| USA-Mid States Net | Tuesdays | 9:00PM CDT | 7275 kHz LSB | Net Control W0CY |
| USA-West Coast Net | Tuesdays | 8:00PM PDT | 3850kHz LSB | Net Control W6CG |
| JA-Net | Mondays | 1300 Z | 3560kHz LSB | Net Control JA1ANG |
| ZL-Net | Mon,Th,Sat | 1900 Local | 3850kHz LSB | Net Control ZL1WB |
| Asia-Pacific Net | Sundays | 1100 Z | 14,280kHz USB | Net Control JA1ANG |
| Western Europe Net | Saturdays | 1000 Z | 14,280kHz USB | Net Control G3IOR |
| | Sundays | 1000 Z | 7060kHz LSB | Net Control G3RWL |
| International Net | Sundays | 1800 Z | 14,280kHz USB | Net Control W3ZM or W3UN |
| | Sundays | 1900 Z | 21,280kHz USB | Net Control W3ZM or W3UN |
| Africa-Europe Net | Sundays | 1730 Z | 14,280kHz USB | Net Control G3IOR |

The following vhf frequencies are also in use:

| | | | | |
|---|---|---|---|---|
| London, England | 144.28MHz FM | Net Control G8CSI | Sundays | 1930 Z |
| Washington, D.C. | 146.25-85MHz FM | WR3ABU | Daily | -- |
| Southern California | 146.25-85MHz FM | WR6ACJ | Daily | -- |
| Tacoma, Wash. | 146.04-64MHz FM | Net Control WA7FVT | Mondays | 1900 PDT |

Bulletins of general interest to those interested in amateur satellites are transmitted regularly on OSCAR-6 reference orbits, at approximately 10 minutes after Ascending Node. These bulletins are transmitted on a Downlink Frequency of approximately 29,490 kHz and can be received over most of Eastern North America.

Readers are requested to inform AMSAT about any corrections or changes to the above net schedules.

Educational bulletins are transmitted regularly by AMSAT Educational Bulletin Stations in North America on even numbered weekdays of the year via the AMSAT-OSCAR 6 two-to-ten meter transponder. These bulletins, addressed to schools, can be heard on 29.50 MHz during morning passes having equatorial crossings between 250 and 305 degrees W. Longitude.

# MINUTES OF THE BOARD OF DIRECTORS' MEETING

## JUNE 10, 1975

The meeting was called to order by President Klein, K3JTE at 8:10 p.m. The following were present:

| | |
|---|---|
| P. Klein, K3JTE | R. Carpenter, W3OTC |
| J. King, W3GEY | T. Clark, WA3LND |
| J. Kasser, G3ZCZ | C. Dorian, W3JPT |
| L. Kayser, VE3QB | W. Dunkerley, WA2INB |

Tom Clark gave a report on the recent meeting of the Amateur Satellite Service Council (ASSC). One item of specific concern was the future status of 2/10 meter transponders for educational purposes. Larry Kayser introduced a plan for the continuation of such a transponder. After considerable discussion this plan was accepted as presented.

Perry Klein introduced a draft proposal for 7MHz - 10GHz satellite allocation requirements for the 1979 WARC. It was agreed to defer discussion of this item until there has been further time to consider the proposal. It was agreed that a special meeting should be held to discuss the proposal.

Discussion was held on a proposal to expend funds for purchase of OSCAR station equipment which could be loaned for special expeditions, experiments or events. Tom Clark reported on the interest of the Northern California DX Foundation and possibly others to participate in providing funds and acting as a depot center for the equipment. It was agreed to advance up to $100 to Tom Clark, as Project Manager for necessary expenses in developing and promoting the "Loaner Program." It was also agreed to reimburse Perry Klein for two AMECO TX-62 two meter transmitters which will be available in this program.

Jan King presented a report on the status of a possible NASA Freedom Beacon project which may permit AMSAT participation for the launch of a limited duration transponder. A 15-to-10 meter transponder is being considered. It is expected that NASA will make a decision within the next month on whether to proceed with this project.

Changes in OSCAR 6 and 7 operating procedures were then discussed. It was agreed to discontinue the educational bulletin transmissions during July and August and to continue to maintain the present OSCAR 6 morning orbits schedule only on Sunday mornings. No change is to be made to the OSCAR 7 operating schedule. It was decided that there wasn't a need for an additional OSCAR net weekly on OSCAR 7.

It was agreed to establish a CAP Petry Memorial OSCAR Educational Achievement Award. Possible joint participation with the Foundation for Amateur Radio is to be explored.

Tom Clark made a presentation on a proposed AMSAT filing on the FCC restructing Docket 20282. He outlined various changes to the original draft. With some additional minor changes the Board agreed to the submission of this filing.

Perry Klein presented his ideas on 29.5 and 145.9 MHz converters for OSCAR education use. It was agreed that he would assume responsibility as "Project Manager" and present more details on it at a future Board meeting.

The status of the University of Surrey (UOS) command station was discussed including a request for funds. It was agreed to provide needed electronic components and for Perry, Larry Kayser and Joe Kasser to prepare a letter to UOS on the status of certain aspects of their command station.

The possibility of a second command station in central Europe is to be explored by President Klein.

A special broadcast experiment on OSCAR 7 by the Technical University of Budapest was approved. Details were published in the June "AMSAT Newsletter."

The Canadian Research Center proposed an emergency locator transmitter.

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(Continued from Page 5)

The rig was torn down Monday and loaded into the car to head for the beach. The beach QTH was a cabin owned by the SC Dept. of Parks and Recreation in the Hunting Island State Park. Hunting Island is near Beaufort, SC, and is two islands north of Hilton Head. When I arrived Monday PM, I set up the antenna in a grove of palmetto trees (and, as it turned out, ticks) about 50 meters from the ocean. The equipment was under a covered porch in the cabin. The first QSO was at 0206Z on 8 July with W1FTX. In the ensuing week, making most of the AO6 and AO7A passes, we ended up with well over a hundred QSO's with 65 different stations in 9 countries, 25 states, and 3 continents. This was enough to qualify for the "Satellite 1000" DX Achievement Award (if the QSL's trickle in). The "Ten Call Districts" Award wasn't achieved since all the W0's were goofing off. In all, I consider it a huge success. The most inconvenient part of the operation was having to run outside 3 or 4 times per pass to re-point the yagi. One night I nearly stumbled over two racoons who decided our front porch was a good place to beg for food. The ticks, fleas, horse flies, etc. also liked the flavor of the antenna "rotor."

The concept of the portable rigs and the suitability of off-the-shelf modules was demonstrated, although not on mode B. If any of you readers are interested in helping out on this project, please volunteer. We would like to have someone build a rugged solid-state receiver for 10m using the KVG SF9B 9MHz xtal filter and, if possible, IC's like the Plessey SL600 series or the National LM373. We need someone with sheet metal fabrication capabilities to assist in the packaging. We need people to assist in fabricating power supplies, antennas, etc.

AMSAT thrives on volunteer labor. If you think you can devote the time, and have the capabilities to follow through on any of these tasks, write me at P. O. Box 27, Washington, D.C. 20044 for details and/or assignments. For those of you who will be at Reston, we hope to show some sort of partial prototype there.

Tom Clark, WA3LND/W0IUF

(Continued from Page 18)

Jan King made a status report on the Phase III satellite program summarized as follows:

| | |
|---|---|
| Germany | - proceeding well, working on command, control, telemetry; looking at frequencies, power and mechanical problems |
| Canada | - working on encoder, decoder layout, and defining test set |
| U. S. | - working on 2304 MHz beacon |
| Australia | - ground support equipment -- limited progress. |

The appointment of various AMSAT Area Coordinators was agreed upon and will be published in the next issue of the Newsletter. Robert Balcom, W3PZK was appointed as another Assistant Membership Chairman.

The meeting adjourned at 11:45 P.M.

C. Dorian, W3JPT
Secretary

## PHOTOS OF AMSAT-OSCAR 7 NOW AVAILABLE

Eight by ten-inch full-color photographs of AMSAT-OSCAR 7 (artist's conception in space with the Earth as a background) are now available for $3.00 U.S. (or 20 IRC's) postpaid from:

Alan L. Bridges, WB4VXP
VHF Communications South
2754 Pine Hill Drive
Kennesaw, Georgia 30144, U.S.A.

Please make your check or money order payable to AMSAT, who will receive the proceeds.

US10c
APOLLO SOYUZ 1975

# "LETTERS AND COMMENTS"

60h
ČESKOSLOVENSKO

Dear Sirs,

Further to your letter dated March 10, 1975 we wish to inform you as follows:

By having your letter as well as the similar letter from ARRL, as well as the assistance of the INTERNATIONAL AMATEUR RADIO UNION - REGION 1, we have succeeded to convince our Authorities in granting to us the frequency band between 432,125 - 432,175 MHz.

In getting this frequency zone, your letter as well as the letters of the other friendly associations, played a major role.

On behalf of the Greek Amateurs preparing now the equipment to use your OSCAR 7 Satellite, we wish to express our most sincere thanks for your cooperation and assistance which helped us in obtaining this frequency allocation.

EUROPA
40M

Yours faithfully,

for the Radio Amateur
Association of Greece

The President, SV1AG
The Secretary, SV1CC

MARINER 10 ★ VENUS/MERCURY
US10c

Dear Gentlemen:

Why didn't I get involved in OSCAR sooner? I have made two contacts and I'm in orbit myself. I worked W5VY and W1FTX via OSCAR 7 Mode A. Harry Price, WB4KGV, gave a talk at the North Fla. Amateur Radio Society club meeting in April and then gave several members an on the air demonstration two days later. This was all I needed. I went right to work on getting something on the air. I've had the necessary equipment for two years but didn't know I could do any OSCAR work with it. My rig is a Heathkit HW-17 (2 meter AM) transceiver running 8 to 10 watts output into an 11 element yagi at 30 degrees elevation and receiving on a SB101 with Janel preamp and rotatable dipole. I modified the HW-17 by installing an open circuit jack into the cathode circuit and plugging an open - circuit plug into the phone jack to disable the audio. It is simple but works. I hope it will work on June 29th (FD) because our club sure needs the 50 bonus points.

73,
Carl E. Staines, W4EAT

Dear Sirs,

My firm preference is for a 70 cm uplink, 2 m downlink. Most of VK1 users agree with my view.

73,

Ed Penikis, VK1VP

Dear Sir,

I finally managed to participate in OSCAR communications. Here on the northern slope of Mount Kilimanjaro, right out in the African bush, obtaining equipment is the main difficulty. After I had been donated with a 5894 tube, an old 72 MHz radiotelephone and 100 ft of coax, it needed only a bit of reading -- (I had no previous VHF experience whatsoever) -- a little patience, some empty Aspirin tins for chassis and a crystal. Fortunately 9116 kHz is one of the local Flying Doctor Service frequencies and multiplies nicely into the satellite band. Finally 50 watts of 145 MHz power emerged from the pile of junk on the workbench. I am glad however, nobody can see what my "station" looks like. To lose half of this power in the coax is sad, but there is no easy way out of that. Crossed dipoles over a chicken wire ground plane eventually completed the installation. It was quite exciting to hear my signal come back from 900 miles above, but I soon realized 145860 kHz was a lonely place. Another Aspirin tin and a few bits and pieces made a VXO. However, to get it working properly needed some headscratching.

I really felt like starting ham radio all over again -- after 15 years -- when 4W1ED replied to my call for a first contact. My very first VHF contact thus was over more than 1000 miles and it won the Jeremy Award, for the first 5Z4 to get a 2 metre signal outside the continent of Africa. Since then I worked 3 continents and 18 countries. I hope to get some 5Z4 company in the not too distant future and tidy up the pile of junk which still comprises my "rig".

Many thanks to AMSAT for the marvelous efforts, in bringing satellite communications to the African bush.

Sincerely yours,

Dr. P. Peham, 5Z4JJ

70c
Nautilus pompilius
KENYA

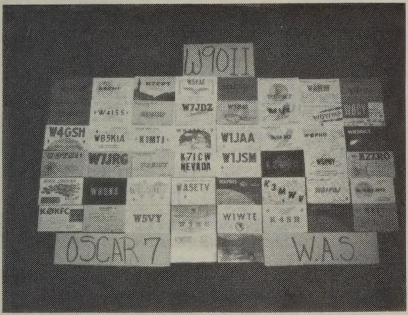
Dear Joe,

On May 11th, I made WAS via OSCAR 7 when I worked WA4LBO/4 in Tennessee on orbit 2209. My cards have been processed and approved by the ARRL and returned to me.

Enclosed is a photo of the QSL cards.

73,

Keith Mason, W9OII



Dear Sir,

Regarding the choice of frequencies for the AMSAT Phase III Transponders -- technically I think that the best choice is 435 up and 145.9 down, -- practically in France, we have two main problems:

a) We have recently lost 433-434.5 MHz and 434.5-440 MHz is reserved for ATV and the licenses are only given after a special request. Could we use 435 for OSCAR without having problems with the ministry of Posts and Telecommunications.

b) Our maximum legal power is 100 W input! How shall we get 1 KW EIRP on 435? When I was F1BF, I built the moonbounce transmitter on 144 MHz for the first EME contact between F and the USA (F8DO-W6DNG); we could not get a special authorization for this test when 1 KW input was absolutely necessary and many people in France thought that 100 W input and a 20 dB gain aerial was enough to work US stations via the moon!

Anyway, I think that it is very necessary to use the 435-438 MHz part of the band so as not to lose it in '79.

73,

Gerard Francon
F6BEG

This is a list of stations using the AMSAT QSL Bureau.

W1NU
K1HTV
W1JAA
K1LJL
K1GXU
WA1POJ
WA1OUB
W1BIH
W1FTX
K1YLU
W1WK
W1WM
WA1RFT
W1JSM
WA1SCV
W2LV
W2BXA
K2ZRO
K2MQY
W2GN
W2GZZ
W2HHG
VK5ZAD/W2
W2YY
W2JB
K2OVS
WA2MPC
K2QBW
W2GVW
WB2UZU
WA2CBB
K2UBC

K2BZT
W2QLI
K2KNV
WA2HGS
WB2FCP
WB2ISX
WB2TNC
WA3DMF
WA3LND
W3KMV
W3JPT
W3HUC
K3TNM
W3BHG
WA3WID
W3TAF
W3QBC
W3ZM
W3GEY
W3HZU
W3LNA
WA3THD
K3JTE
W3TMZ
W3CPU
WA3NAN
K3SWZ
WA3EPT
WB4KGV
WA4GBE
WB4RUA
W4FPS

W4FJ
WA4LBO
W4ART
W4DO
WA4BCX
WB4UOK
W4GCB
K4TI
WB4YFC
K4GSX
WA4JID
K4CYF
W4WSF
WA4NKN
W4WNH
K5RZU
K5KQG
W5UB
K5LZO
W5UCY
WB5KIA
WB5DCY
W5VY
K5LLL
K5BWZ
K6BAZ
W6OAL
W6CG
W6KMV
WB6PZW
W6NTY
W6RQZ

W6APW
W6ELT
WA6WTX
WA6RQP
W6ISQ
WA6TUF
W6VOD
W6DOW
WB6OVH
W6ABN
W7ZRQ
W7KJK
W7VEW
W7CTY
WA7GXJ
WA7TZY
W7LFX
W8DX
W8WNH/4
K8MYN
W8SMC
K8IRC
KA8KH
W8BT
WB8OFR
WDX8KHV
WA8KEM
W9OII
W9QQG
K9JUU
W9TGB
W9JUV

K9RSF
K9DTB
WB9IFG
K9EIV
W9TFY
W9KJV
W0LCN
W5SLL/0
K5YZQ/0
W0IUF
W0CY
W0WMP
WA0SAR
W0QIN
W0RWC
VE5XU
VE3BNO
VE3TW
VE3DTW
VE3EVW
VE3FJQ
G3ZCZ
OA8V
KL7MF
YV4WT
TI2XS
TI2NA
TI9NS
VP2MJ
F2MA
F0BQM
  via K2ZRO

AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF $50.00 OR MORE FROM THE FOLLOWING NEW LIFE MEMBERS

| | |
|---|---|
| LM-327 | J. R. Goldstein, WN6AYA |
| LM-328 | E. F. Steeble, K3IXD |
| LM-329 | Dr. P. Peham, 5Z4JJ |
| LM-330 | Guenter Vaupel, DK4QE |
| LM-331 | J. K. Oksanen, OH5NR |
| LM-332 | R. J. Sullivan |
| LM-333 | E. H. Taylor, VE3FRM |
| LM-334 | F. Wiedemann, CN8HD |
| LM-335 | P. G. Arvin, KL7FBU |
| LM-336 | A. F. Rotschi, HB9MHC |
| LM-337 | D. D. Shearer, WA6MMY |
| LM-338 | Dr. M. Davidoff, K2UBC |
| LM-339 | Edvins Penikis, VK1VP |
| LM-340 | F. S. Benevides, W1BOJ |
| LM-341 | Dr. T. Damboldt, DJ5DT |
| LM-342 | S. T. Lund, WA8LLY/6 |
| LM-343 | Oscar Martinez, EA4ID |
| LM-344 | J. D. Kowalik, K2OPT/0 |
| LM-345 | J. C. Kanode, W4WSF |
| LM-346 | S. J. Murray, K1KEC |
| LM-347 | Yoshiaki Saito, JA0PX |
| LM-348 | Masashi Yoshinari, JA0AW |
| LM-349 | Bernard Montrobert, F1AHE |
| LM-350 | Ray D. Williams, WA4UJP |
| LM-351 | Dr. Mervin H. Grossman, W5FIB |
| LM-352 | D. Boone |
| LM-353 | M. C. Towns, Jr., K6LFH |
| LM-354 | L. Ferns, VE3BZF |
| LM-356 | Joseph H. Reisert, Jr., W1JAA |
| LM-357 | Stephen L. Hose, WA9AXE |
| LM-358 | Richard H. Porter, WB4YFC |
| LM-359 | Joseph L. Mueller, WA2HSF |
| LM-360 | Charles J. Schmitt, WA3VRH |
| LM-361 | Edward C. Lips, W3BWU |
| LM-362 | William J. Bennett, K3TNM |
| LM-363 | Eugene F. Ruperto, W3QYG |
| LM-364 | Pier L. Bargellini, WA3KNN |
| LM-365 | Guy Black, WB8LBX/W4PSJ |
| LM-366 | James M. Stitt |
| LM-367 | Tareck R. Elass, WB9FUV/6 |
| LM-368 | Hershel A. Jackson, WA0MBC |
| LM-369 | W. D. Beckwith, W7AGC |
| LM-370 | Lorenzo Cerrato, I6FTR |
| LM-371 | Hugo Adelino da Silva, PY2DSQ |
| LM-372 | David H. Thompson |
| LM-373 | H. W. Sanders, WA5RSU |
| LM-374 | George R. Bailey, WA3HLT |
| LM-375 | J. David Carpenter |
| LM-376 | David C. Nelson, K7RGE |
| LM-377 | Johnny Ortiz, KP4GN |
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This authorization makes possible experiments involving remote data processing via OSCAR communications links. For example, it might be possible to access a digital computer remotely via OSCAR. Please contact AMSAT Hdq. if you are interested in participating in an experiment of this type (on experiment days, perhaps).

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